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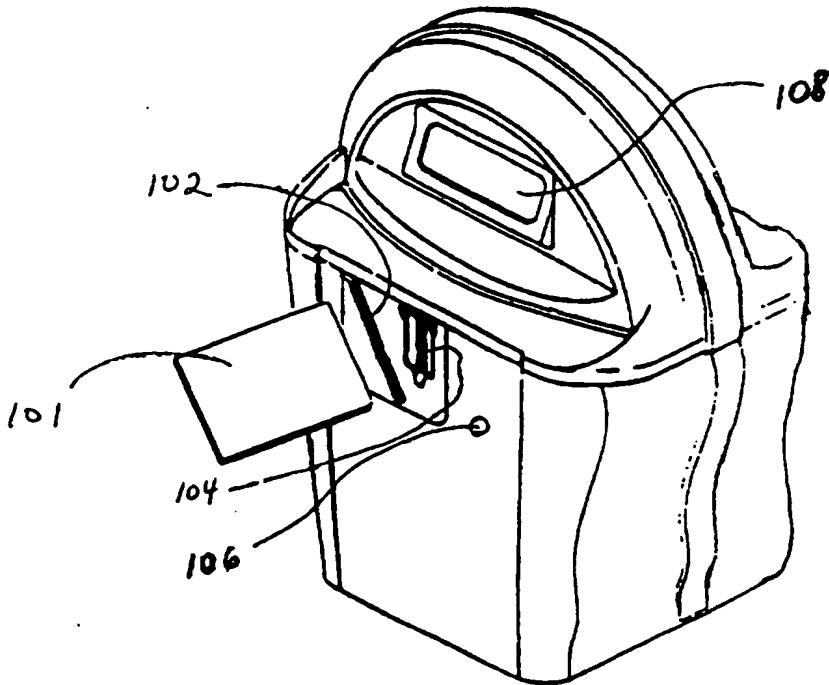
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: REFUND OPTION ON PARKING CARD

## (57) Abstract

A parking meter system is disclosed in which a smart card (101) is used as method of payment. This smart card is inserted once into a parking meter to start the meter use time and inserted a second time to end the meter use time. Upon the second insertion (200) of the card, a refund is calculated (225) and credited to the card. Zeroing of the parking meter is accomplished by giving the refund (235). This reduces motorist cruising to find a meter with remaining time.



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# Refund Option on Parking Card

## BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to electronic parking meters which accept smart card input, and specifically to a feature which reduces the practice of motorists cruising to find time remaining on a meter.

Vending machines which track time purchased for parking spaces have been around for 5 many years as a means for metropolitan areas to charge for the use of parking space. The types of machines fall into two general categories, depending on the situation in which they will be used.

Parking meters, as the terminology is used in this application, are designed to be placed adjacent to a parking spot and will only accommodate a small number of vehicles. Parking 10 meters can be placed adjacent to each parking space, shared between two adjacent parking spaces, or, where two rows of parked cars face each other, one meter may serve a maximum of four vehicles.

Central collection systems, on the other hand, are designed for situations where one central location may serve a large number of parking spaces.

15 These two categories of parking vending machines have evolved in different directions to meet these different needs and face some different constraints on their use. One example is power usage. Where a central collection system serves a large number of spaces, external power connections are possible and if batteries are used, the need to charge a single (or small number) of batteries is not a critical problem. On the other hand, because a large number of 20 parking meters may be spread out across a wide area, these do not lend themselves to external power supplies, and must be power conserving to avoid frequent maintenance. As another example, parking meters typically contain some type of a visual display to show whether there is any time remaining for the parking space controlled by the meter. Such a display is useful not only to motorists purchasing time but also to a law enforcement official who is checking 25 for parking violations. In contrast, the central collection systems, although they may display

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a time purchased as the initial transaction is made, do not, as a general rule, give a visual signal as to the status of each parking space.

5 In many municipalities, since each parking meter provides a visual indication of its status, an annoying problem has arisen. In these situations, drivers will often cruise down a street containing a row of parking meters, looking for one with time remaining on it. This cruising can cause additional problems with handling the traffic flow, and many attempts have been made to discourage this behavior.

10 Various designs have been introduced for parking meters that automatically erase the remaining time when a vehicle leaves the space. These generally use some form of presence detector, to indicate to the meter whether a vehicle is actually present in the spot at any given moment. Unfortunately, this type of design is easily foiled by outside interference or vandalism. Since this fact is known, the parking violator may too easily contest his fine, alleging that the meter erased the purchased time too soon.

#### Parking Meter System with Refund Option

15 The use of electronic parking meters, which can accept electronic payment from a payment card, allows an innovative solution to be used. Using this system, the motorist is encouraged to purchase a maximum amount of time on the meter using his payment card, and is given the assurance that when he returns, he can obtain a refund for any unused time. When 20 the motorist returns, he simply inserts his payment card into the meter and the meter refunds the purchase price of any time remaining. This refund is credited electronically to his payment card, while at the same time the time remaining on the meter is set to zero and the display is changed to show an expired status.

25 U.S. Patent 4,876,540 to Berthon *et al.* discloses a central collection system which may be configured to offer a refund to the motorist. However, the central collection system of Berthon *et al.* is used to control a large number of parking spaces; it is contemplated in Berthon *et al.* that this central collection system will dispense a slip of paper that shows the expiration time. Information regarding the transaction may be retrieved from the central collection system or related hand-held unit, but the system does not display status for the spaces controlled by the system, hence cruising is a problem which is neither contemplated nor solved by this patent.

30 Inducing a motorist to reset a parking meter to zero, by offering a refund of unused time, is a novel means of addressing a hitherto troublesome problem.

35 Additionally, because the serial number of a parking card would be read by the meter, the meter can optionally be programmed to disallow purchase of additional time from the same card (called meter feeding) to exceed the legal parking time limit of the meter. This feature would encourage the parking turnover for which parking meters were originally invented.

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Advantages

The disclosed innovations provide at least the following advantages:

- Motorists are encouraged to use payment cards, which reduces theft from parking meters;
- The user, who may not know how long he will need the parking spot, has the convenience of purchasing the maximum time allowed, with the assurance that he will not be wasting money on time not used;
- 5 • The use of parking cards makes it easier to detect users who try to exceed the legal time limit, encouraging turnover;
- Time remaining on the meter is zeroed without the unreliability of presence detectors;
- 10 • Parking tickets for expired time are more enforceable, since the technology is more reliable;
- Cruising for parking meters with available time is discouraged.

Brief Description of the Drawing

The disclosed inventions will be described with reference to the accompanying drawings, which show important sample embodiments of the invention and which are incorporated in the 15 specification hereof by reference, wherein:

Figure 1 shows a parking meter which accepts a payment card input and which has a visual indicator of time remaining.

Figure 2 is a flowchart of the decision process when a smart card is inserted.

Figure 3 is a block diagram of a parking meter which can be programmed to provide refunds 20 and zero the meter.

Detailed Description of the Preferred Embodiments

The numerous innovative teachings of the present application will be described with particular reference to the presently preferred embodiment (by way of example, and not of limitation), in which:

25 As seen in Figure 1, slot 102 in the parking meter will accept a payment card (101) proffered for payment. (It is understood that other means of payment may be received by the meter, such as coin input 104, but, since the preferred embodiment of the parking meter does not offer refunds for time purchased with coins, these will not be discussed at this time.)

In the presently preferred embodiment, the payment card will be a "smart" card, which 30 contains electronic circuitry, such as a microprocessor, to handle transactions. The smart card will typically, but not necessarily, have been issued by a parking authority which has jurisdiction over a given area and is useful only in the jurisdiction in which it is purchased. The smart card will typically be preprogrammed with a given monetary value, which is the

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purchase price of the card. Each usage of the card causes the value in the card's memory to be decremented until no value remains. At the option of the issuing authority, the card could then be returned for reprogramming with a new purchase price, or discarded.

After insertion of the parking card, the meter will then prompt the user to select an amount of time to be purchased, e.g., the user may be prompted to press button 106 once for each 15 minutes of time required, or the time requested could be entered on a keypad (not shown). After the time is selected, the meter computes the value of this time and deducts this amount from the payment card, if possible. An error message will be given if the value remaining on the card is not sufficient for the time requested, otherwise, an acknowledgement of the transaction is displayed, e.g. on display 108, to provide visual assurance to the user that the transaction has been completed. This display can take different forms, such as a liquid crystal display or a flag-wheel.

Once the motorist is ready to leave the parking space, the payment card can be once again inserted into the parking meter. The meter retains a record of the serial number (and will retain up to three serial numbers per space) which is used to purchase time and will refund the cost of any remaining time when that card is reinserted.

Figure 2 shows a flowchart of the decision process for the use of a payment card. As is seen in this flowchart, when the processor detects that a card has been inserted (step 200), it next checks to see if this serial number is in memory (i.e., has been previously used for payment) (step 205). If not, the processor prompts the user to select the time desired (step 250), then checks to see that a valid value is entered (step 255). A valid response causes the processor to calculate the value of the desired time (step 260), then check the proffered card for available credit (step 265). An invalid value entered or lack of enough credit on the card will both prompt an error message (step 267). When proper credit is available, the value of the time requested is deducted from the card (step 270), the timing circuits are activated for the requested time (step 275), and acknowledgement is made of the transaction (step 280).

If, when the card is inserted (step 200), it is detected that the serial number is in memory, the processor will proceed to calculate the value of any time remaining for the associated space (step 215). The value of the remaining time is compared to a threshold value (step 220); if it is not greater than the threshold, an error message is displayed (step 222), such as "No Refund Available"; otherwise the computed value is refunded to the card (step 225) and an acknowledgement is displayed (step 230). Note that if, for example, time is purchased in increments of 15 minutes, no refund would be available for remaining time of 14 minutes or less. Regardless of whether the value was greater than zero or not, the meter would be zeroed (step 235).

Figure 3 provides a block diagram of a parking meter which can be programmed to utilize the innovative refund option. The processor (310) communicates with circuitry to

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identify coin input (320), with a reader (330) for the parking card, and with a display (340). Power is supplied to each of these elements by the power supply (300), which is typically a battery. Further details of such a meter can be found in U.S. Patents 5,360,095 and 5,475,373 and in U.S. Patent Application 08/428,771, all of which are hereby incorporated by reference.

5 **Modifications and Variations**

As will be recognized by those skilled in the art, the innovative concepts described in the present application can be modified and varied over a tremendous range of applications, and accordingly the scope of patented subject matter is not limited by any of the specific exemplary teachings given.

10 For an example, the payment card above generally refers to a smart card, but another type of card which does not contain circuitry can also be used, e.g., a card which uses magnetic tape for memory. If means are available to communicate with a central computer, a regular credit card or a card which identifies a centrally available account could also be used.

15 Contactless cards are becoming popular in transit application, such as buses and subways, and this type of card could be used in parking meter systems, such as the disclosed refundable system. Since the reader in contactless applications has high power requirements, it could not remain constantly active, as is typical. However, by requiring the user to insert the contactless card into a slot, this action could activate an extremely close range transmitter and receiver within the slot. This would require very little power, as the card would be exactly 20 positioned and very close to the card reading apparatus.

Although the disclosed parking meter automatically assumes that the second insertion of a payment card is a request for a refund, other configurations can alternatively be used, such as allowing the user to insert their card again to purchase additional time and providing a refund only when an external signal is provided, such as pushing a button on the meter.

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CLAIMS

What is claimed is:

1. A parking meter, comprising:  
a display which gives the status of each parking space it serves; and  
refund circuitry which will refund the value of unexpired vended time and change said display to show the status to be expired.
2. The parking meter of Claim 1, wherein said parking meter is an electronic meter.
3. The parking meter of Claim 1, wherein the value of said unexpired vended time is refunded to a smart card from which payment for said vended time was made.
4. A parking meter serving between one and four adjacent parking spaces, said parking meter comprising:  
payment circuitry connected to receive a payment from a payment card;  
timing circuitry, connected to said payment circuitry, to calculate time vended in response  
5 to said payment and to provide a signal when said time vended has expired;  
a display, connected to said timing circuitry, which shows the status of each parking space served by said parking meter;  
refund circuitry which is connected  
to recognize that a refund is requested,  
10 to provide a refund for time vended which has not expired, and  
to set said display to show an expired status for a corresponding parking space.
5. The parking collection system of Claim 4, wherein a payment card is inserted into said parking meter to contact said payment circuitry.
6. The parking collection system of Claim 4, wherein said refund circuitry recognizes that a refund is requested when said payment card is inserted a second time.
7. The parking collection system of Claim 4, wherein said payment card is a smart card.

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8. A parking meter system, comprising a plurality of parking meters, each parking meter controlling four or fewer adjacent parking spaces, each parking meter comprising:
  - a display which provides a visual indication of the status (expired or unexpired) of each parking space controlled by said parking meter;
- 5 refund circuitry which is connected to said display and connected to recognize that a refund is requested;
  - wherein, when a request for a refund is received, said refund circuitry refunds the purchase price of any purchased time which has not expired, and causes said display to show a status of expired for a respective parking space.
9. The parking collection system of Claim 10, wherein said refund circuitry recognizes that a refund is requested when said payment card is inserted a second time.
10. The parking collection system of Claim 10, wherein said payment card is a smart card.
11. A method of operating a parking meter, comprising the steps of:
  - (a.) providing a parking meter capable of interacting with a portable module to receive payment for time vended;
  - (b.) vending time for a respective parking space associated with said parking meter
  - 5 according to a given protocol, in response to payment received from said portable module;
  - (c.) displaying at least a status of said vended time as unexpired or expired;
  - (d.) when a request for a refund is received, crediting the cost of unused vended time to said portable module from which it was received and setting said display to expired.
12. The method of Claim 14, wherein a payment card is inserted into said parking meter to proffer payment.
13. The method of Claim 14, wherein said portable module is a smart card.
14. A parking meter, comprising:
  - payment circuitry which accepts a first payment from a portable module and saves an identification from said portable module;
  - wherein said payment circuitry refuses to accept further payments under at least some conditions from any portable module having a matching identification.
- 5 15. The parking meter of Claim 14, wherein said portable module is a smart card.

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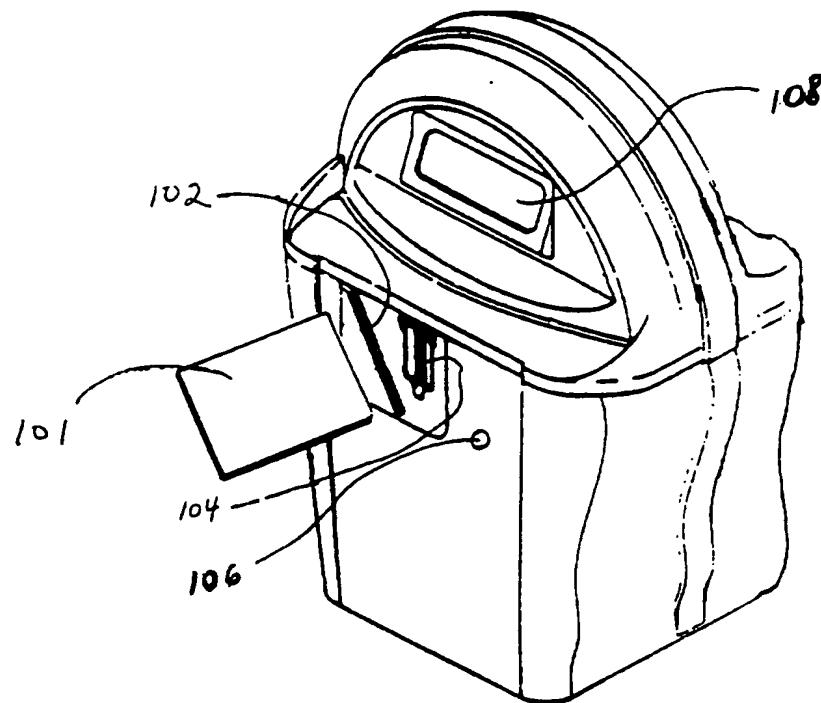


FIG. 1

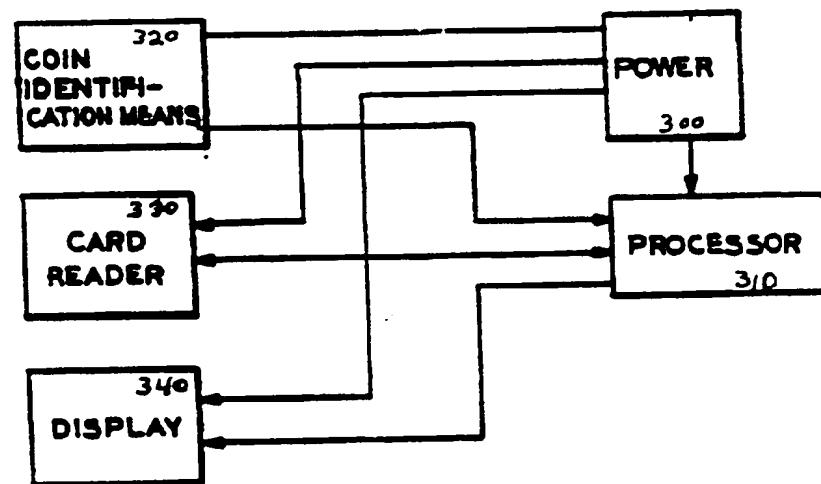


FIG. 3

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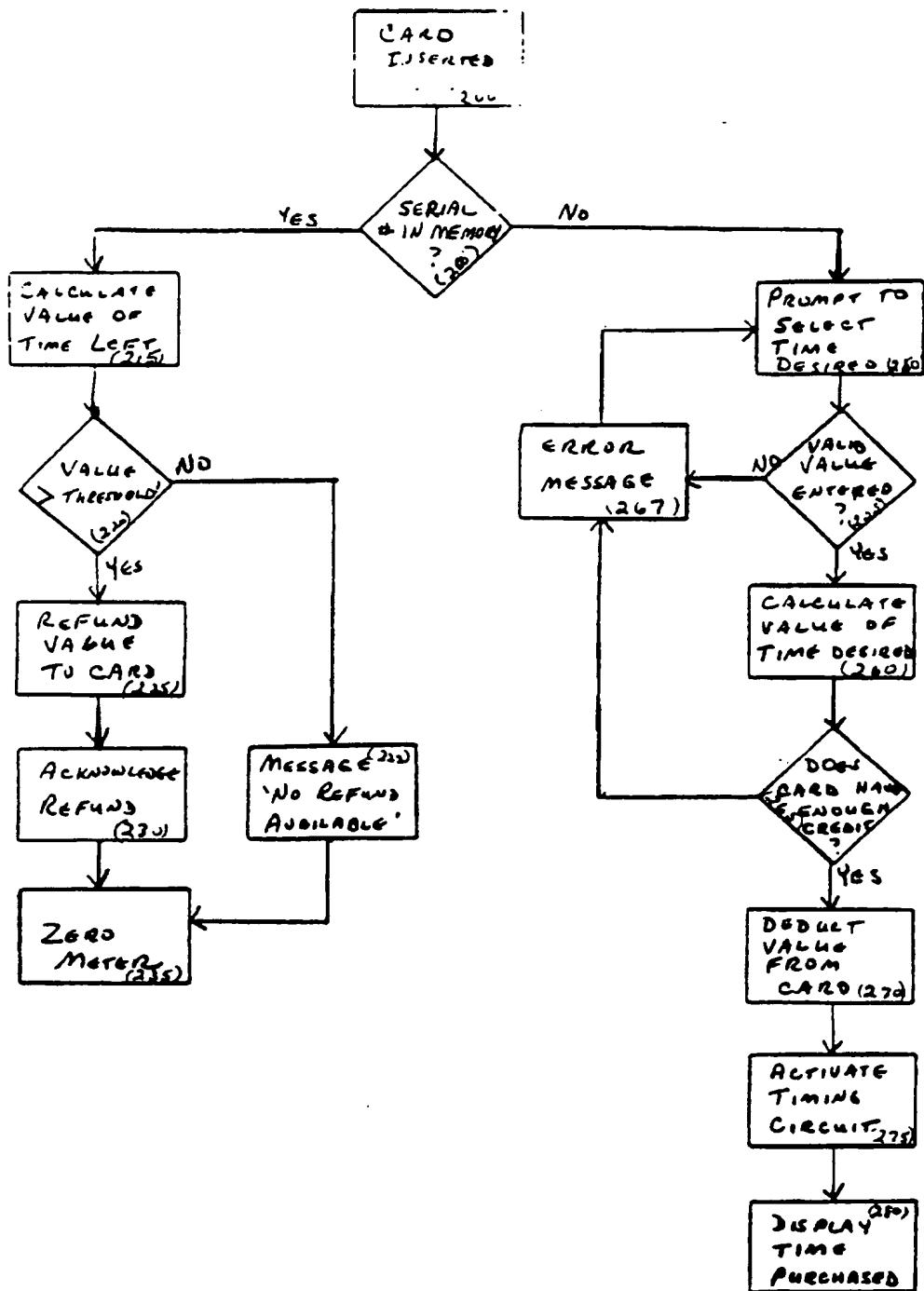


FIGURE 2

## INTERNATIONAL SEARCH REPORT

Internal application No.  
PCT/US97/02784

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G07B 15/02

US CL : 235/384, 380, 375

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 235/384, 380, 375

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

N/A

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

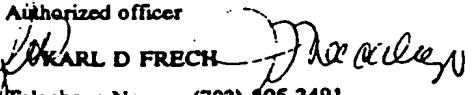
search terms: parking meter, IC card, smart card, card, refund

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----	US 4,861,971 A (CHAN) 29 August 1989 (29/08/89), col 3, line 47 - col 4, line 42.	1-6,11-12, 14 ----
Y		7-8,13,15
A	US 4,876,540 A (BERTHON ET AL) 24 October 1989 (24/10/89), see entire document.	1-15

 Further documents are listed in the continuation of Box C.  See patent family annex.

*A*	Special categories of cited documents:	*T*	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
*B*	document defining the general state of the art which is not considered to be of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
*L*	earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
*O*	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A*	document member of the same patent family
*P*	document referring to an oral disclosure, use, exhibition or other means		
	document published prior to the international filing date but later than the priority date claimed		

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## INTERNATIONAL SEARCH REPORT

International application N .  
PCT/US97/02784

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
  
  
  
  
2.  Claims Nos.: 9 and 10 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
  
these claims are both dependent upon claim 10. Claim 10 is not independent nor does it depend from any other claim except itself. Claim 9 is therefore dependent upon a dependent claim dependent only from itself.
  
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
  
  
  
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

## Remark on Protest

The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.